
ENVIRONMENTAL Fact Sheet



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Removal of Iron and Manganese From Drinking Water - A Summary

This document provides a brief introduction to treatment options for removing iron and manganese (Fe/Mn) from drinking water. A more detailed technical document, identifying constraints, benefits and drawbacks of each treatment option, is available upon request. That fact sheet is WD-WSEB-3-7, "Removal of Iron and Manganese from Drinking Water - Technical Version."

Observed Problems

Iron and manganese occur naturally in New Hampshire's geology. Iron and manganese dissolve into groundwater as acidic rainfall percolates through the soil and rock. In higher concentrations, iron and manganese cause the following problems:

- Staining. Iron and manganese stain laundry and water use fixtures.
- Taste. Iron and manganese cause a metallic or vinyl type taste in the water.
- Appearance. Iron and manganese will often appear as an oily, "crusty" sheen to the water's surface.
- Sulfur Taste. The same conditions that liberate iron and manganese underground can liberate hydrogen sulfide from the soil or rock.
- Clogging. Iron and manganese supports the growth of iron and manganese bacteria, which can clog strainers, pumps, and valves.

Health Effects

EPA has established "secondary" standards for Iron and manganese in drinking water. These limits are based on aesthetic concerns such as staining, taste and odor. These limits are:

Iron	= 0.30 mg/L (milligrams per liter, or parts per million)
Manganese	= 0.05 mg/L

At present, EPA has not set health standards for either iron or manganese in drinking water. However, a health based standard for manganese is possible. Manganese may affect neurological and muscle function in humans. The DES Health Risk Assessment Program has adopted an interim health based standard for manganese of 0.84 mg/L.

Treatment is not generally necessary to remove minor iron and manganese concentrations even if over the secondary aesthetic limits, unless you are actually experiencing objectionable staining.

Identifying the Type of Fe/Mn Before Choosing a Treatment Process

Iron and manganese comes in three different forms, which cause the appearance of the water to range from clear to discolored. Not all treatment methods work on all forms of iron and manganese. They are:

1. Water is totally clear when drawn from the tap; 90 percent of New Hampshire cases.

Iron and manganese is present in the dissolved form. The terms "clearwater iron or manganese" or "ferrous" and "manganous," are often used to describe this form.

2. Water is rusty colored when drawn from the tap; 10 percent of all New Hampshire cases.

When exposed to oxygen, clearwater iron and manganese will precipitate to form fine brownish (ferric) or blackish (manganic) "rust" particles.

3. Water has a yellow tint, but is totally transparent and the color does not settle out with time; less than 1 percent of New Hampshire cases.

Iron and manganese is probably combined with organic matter in the water (tannins). This is commonly called colloidal Iron and manganese. This form of Iron and manganese will not settle out, is too small to be removed by filtration, and generally will not be effectively treated by a normal water softener. Colloidal iron and manganese is very difficult to remove.

Water Quality Tests

In order to determine which treatment process will work for your particular water quality, you must know certain water quality factors. Typically important factors for iron and manganese removal include:

- Iron & manganese concentrations
- pH, hardness
- Dissolved oxygen for some treatment types (this is a field measurement)
- Presence of iron and manganese bacteria

When sampling, be sure to let the cold water run for five minutes and remove any aerators or filters before taking your sample. Sample containers can be obtained from the DES Laboratory, which can be reached at (603) 271-3445 or 271-3446.

Overview of All Treatment Categories

The options for treating iron and manganese are summarized below. Greater detail concerning each treatment type and its advantages and drawbacks, are discussed in the fact sheet, WD-WSEB-3-7 "Removal of Iron and Manganese from Drinking Water - Technical Version."

Techniques For Preventing Staining Without Removal of Fe/Mn

In municipal water systems sequestering chemicals (typically poly-phosphates) are added to the water supply. This approach is only effective for relatively low concentrations of iron and manganese and only where the iron and manganese is dissolved. Phosphates may aid bacterial growth and lose their holding ability with time. This is not commonly used for private home wells.

Removal Techniques For Dissolved Fe/Mn (Clearwater form)

Softening

Disadvantages: Adds sodium to drinking water and creates brine disposal concern.

Advantages: It uses a low cost, simple chemical, i.e., salt.

Oxidation/Filtration Removal (pH level critical). Many slight variations of the process: Potassium permanganate, greensand filtration Catalyst/oxygen coated filter material: Venturi nozzle - air supplement.

Removal Techniques For Already Precipitated Fe/Mn (Rusty form)

Only the filtration options described immediately above will remove precipitated Iron and manganese.

For More Information

For more information please call the Water Supply Engineering Bureau at (603) 271-2513. We would appreciate your comments concerning iron and manganese treatment. Also see the DES fact sheet WD-WSEB-2-5 "Considerations When Purchasing Water Treatment Equipment." More DES drinking water fact sheets are available on-line at <http://www.des.nh.gov/ws.htm>.